WHAT IS CLAIMED IS:

1. A 2,4-D-monooxygenase gene in substantially pure form or a biologically active fragment thereof.

2. An isolated DNA sequence encoding a polypeptide having the biological activity of a 2,4-D-monooxygenase, or a nucleic acid useful as a probe specifically for and which hybridizes with such a sequence.

3. A DNA sequence of claim 1, having the sequence recited in Figure 10, a complementary strand thereof, a sequence differing therefrom by codon degeneracy, a sequence which hybridizes therewith and encodes a 2,4-D-monooxygenase, or a nucleic acid useful as a probe for and which hybridizes with such a sequence.

4. An isolated DNA sequence of claim 2, encoding a polypeptide having the biological activity of a 2,4-D-monooxygenase.

5. A nucleic acid sequence of claim 1 which is a 2,4-D-monooxygenase gene or a fragment thereof coding for a polypeptide having the biological activity of such a monooxygenase.

6. An oligonucleotide useful as a probe which hybridizes with a nucleic acid sequence of claim 1.

7. A oligonucleotide probe of claim 6, labelled with a detectable moiety.

8. A recombinant vector comprising exogenous DNA of claim 1.

9. A vector of claim 8, wherein the exogenous DNA is under the control of a heterologous promoter.

10. A substantially pure mutant ~~monoamine oxygenase~~ 2,4-D-monooxygenase gene, wherein at least one nucleic acid is substituted for, inserted into and/or deleted from a ~~monoamine oxygenase~~ 2,4-D-monooxygenase gene of claim ~~1~~ 45, and wherein the resultant product is useful as a probe specific for the monooxygenase gene.

11. A substantially pure mutant ~~monoamine oxygenase~~ 2,4-D-monooxygenase, wherein at least one amino acid is substituted for, inserted into and/or deleted from a ~~monoamine oxygenase~~ 2,4-D-monooxygenase encoded by a gene of claim ~~1~~ 45.

12. A mutant ~~monoamine oxygenase~~ 2,4-D-monooxygenase gene of claim 10, which is not capable of expressing a biologically active product.

13. A recombinant vector comprising exogenous DNA of claim 12.

14. A mutant plasmid comprising all genes important for degradation of 2,4-dichlorophenoxyacetic acid, wherein the gene for 2,4-D-monooxygenase has been altered such that the biological activity of 2,4-D-monooxygenase is destroyed.

15. Plasmid pJP4:Tn5-2, a plasmid of claim 14.

16. Plasmid pJP4:Tn5-4, a plasmid of claim 14.

17. Plasmids pVJH21, pGJS3, pKJS31, pKJS32, pKJSB330, pKJS(x)630 and pKJS32RHΔS', each a vector of claim 8.

18. Plasmids pTRJS'B435, pTJS'B436, pTJSS'035, pTJSS'036, pTJS'x535 and pTJS'x536, each a vector of claim 9.

19. Phages MJSS'030 and MJSS'031, each a vector of claim 13.

20. Plasmid pKJE B130, a vector of claim 13.

21. Plasmid pTJS'x535omega, a vector of claim 13.

22. A method of identifying and isolating a vector containing a 2,4-D-monooxygenase gene comprising growing on selective media a bacterium transformed with a plasmid of claim 14 and cotransformed with a vector to be tested.

23. A bacterial strain transformed with a vector of claim 8.

24. A bacterial strain transformed with a vector of claim 12.

25. A recombinant vector comprising exogenous DNA of claim 10.

26. A recombinant vector comprising exogenous DNA of claim 25.

27. An E. coli strain of claim 26.

28. A Pseudomonas strain of claim 26.

29. An Alcaligenes strain of claim 26.

30. An Agrobacterium strain of claim 26.

31. Plasmids pUJC1001, pUJCO1003, pmCJ1007 and pmLJC1005, each a vector of claim 22.

32. A transgenic microorganism or plant comprising an exogenous DNA sequence of claim 1.

33. A transgenic plant wherein the exogenous DNA is a vector of claim 25.

34. A transgenic plant wherein the exogenous DNA is a plasmid of claim 31.

35. A transgenic microorganism or plant comprising cells of a microorganism or plant transformed with a vector of claim 9.

36. A transgenic microorganism or plant comprising cells of a microorganism or plant transformed with a vector of claim 25.

37. An antibody capable of binding to 2,4-D-monooxygenase.

38. A monoclonal antibody of claim 37.

39. A fragment of an antibody of claim 37, which fragment is capable of binding 2,4-D-monooxygenase.

40. An antibody fragment of claim 39, which is the Fab fragment.

41. An antibody of claim 37, which is labelled.

42. A method of preparing a polypeptide having the biological activity of ~~monoamine oxygenase~~ 2,4-D-monooxygenase, comprising culturing a ~~cell~~ transgenic plant of claim ~~32~~ 13.

43. A method of preparing a polypeptide having the biological activity of ~~monoamine oxygenase~~ 2,4-D-monooxygenase, comprising culturing a cell of claim ~~28~~ 11.

44. A method of preparing a polypeptide having the biological activity of ~~monoamine oxygenase~~ 2,4-D-monooxygenase, comprising culturing a cell of claim 26.